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Visual Impairment and Its Affects on Gross Motor Development: A Literature Review and Implications for Physical Therapy

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VISUAL IMPAIRMENT AND ITS AFFECTS ON GROSS MOTOR DEVELOPMENT: A LITERATURE REVIEW AND IMPLICATIONS FOR PHYSICAL THERAPY

by

Jodi Toenjes
Bachelor of Science in Physical Therapy
University of North Dakota, 1997

An Independent Study

Submitted to the Graduate Faculty of the

Department of Physical Therapy

School of Medicine

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Master of Physical Therapy

Grand Forks, North Dakota
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1998

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This Independent Study, submitted by Jodi Toenjes in partial fulfillment of the requirements for the Degree of Master of Physical Therapy from the University of North Dakota, has been read by the Faculty Preceptor, Advisor, and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

Peggy M. Mohr
(Faculty Preceptor)

Peggy M Mohr
(Graduate School Advisor)

(Chairperson, Physical Therapy)

PERMISSION

Title	Visual Impairment and its Affects on Gross Motor Development: A Literature Review and Implications for Physical Therapy
Department	Physical Therapy
Degree	Master of Physical Therapy

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Date 12-16-97

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ABSTRACT

Visual impairment, or blindness, in the pediatric population has been shown to affect several key areas of gross motor development. Many of these areas can be positively influenced by physical therapy techniques. However, some physical therapy curriculums do not teach this topic of study because the prevalence of blindness is low. The purpose of this study is to develop a teaching manual that will provide the physical therapist with specific exercises, activities, and helpful hints that will facilitate the treatment of a patient with blindness in a pediatric setting.

The manual includes information regarding common mannerisms of the blind population and physical deficits that occur with blindness such as body spatial awareness deficits, weakness of certain muscle groups, abnormal gait patterns, and postural abnormalities. The procedure used to perform this study was a literature review that includes a thorough explanation of the developmental problems associated with visual impairment. Information regarding the utilization of residual vision and treatment implications related to physical therapy is presented. Pictures of treatment techniques with a pre-school aged are shown for clearer representation of technique. This manual is designed to provide physical therapists with information to facilitate assessment and treatment of pediatric patients with visual impairments.

CHAPTER ONE

INTRODUCTION

In physical therapy there are few instructions we give that don't require the patient to use his or her sense of vision, especially when motivating someone to perform a task. For example, "let's walk to that chair," and "reach up for the red ball," are common statements in a typical therapy environment. When working with children with visual impairment, it is necessary to make proper modifications in the method of communication and treatment techniques to adapt to this population.

With a degree in physical therapy, students have acquired many skills that will assist them in addressing and treating deficits in the sighted population. However, in the common physical therapy curriculum, little time is devoted to teaching students the effects of visual impairment on physical development and the corresponding treatment for these problems.[1]

Much research has been done on the visually impaired in order to determine key areas of need. As many of these areas are directly related to physical therapy, one could assume that a growing number of patients with blindness will be referred to therapy in a pediatric setting. For example, parents may require information on ways to incorporate orientation and mobility concepts, assist locomotion, and help their child receive sensory experiences to make up for lost visual stimulation. In many areas of the United States, especially rural ones, professionals that specialize in the treatment of this population are not

readily available.[1,2] Therefore, a physical therapist who is knowledgeable in this topic could assume responsibility for the treatment of such cases.

Patients with visual impairment will not only be seen in pediatric clinics. In any physical therapy setting, it is possible to be faced with the opportunity to work with a patient with blindness. Helpful information regarding methods of communication and common mannerisms of people with visual impairments is included to facilitate treatment in any physical therapy setting.

The purpose of this study is to develop a manual that provides the physical therapist with specific exercises, activities, and helpful hints that facilitate the treatment of a patient with blindness in a pediatric setting. The procedure used to perform this study was a literature review followed by treatment implications related to blindness. The resulting manual consists of a variety of approaches to treat each deficit so that physical therapy students may be better prepared to address the special needs of children with visual impairment.

CHAPTER TWO

PRODUCTION OF THE MANUAL

The purpose of this manual is to provide a review of the literature and pictures of physical therapy techniques adapted to meet the needs of children with visual impairment. This manual will be used as a teaching aid for physical therapy students and professionals. Prior to producing the manual, several topics related to gross motor deficits that occur with blindness were researched. Physical therapy techniques that have been adapted to the children with blindness are few, therefore treatment activities that are adapted to facilitate treatment with this population were developed by the administrators. The techniques discussed in the manual are modifications of treatment activities taught in the physical therapy curriculum at the University of North Dakota. Certain activities are modifications of techniques found in the literature, each is cited following the title of the activity. Each technique was chosen based on ease of application in the treatment of deficits related to blindness. Treatment of the following deficits are included: problems with body image, delayed developmental milestones, poor posture, abnormal gait patterns, poor balance, and decreased physical fitness.

The manual was organized into three sections: literature review, residual vision, and physical therapy technique. After writing the literature review and developing techniques to facilitate therapy with a child with visual impairment, the North Dakota School for the Blind was contacted with a request for assistance in locating a child with visual impairment.

It was decided that including pictures would provide clearer representation of technique. The child's parents were contacted and agreed to allow their child to participate in the production of a manual including pictures and a video of the techniques. The video was produced by Amy Skalsky for partial fulfillment of her graduate school requirements.

Grafton State Developmental Center, of Grafton, ND, was contacted to request the use of their facility for a treatment session during which the pictures would be taken. (Appendix A) The taping session was set for October 28, 1997 and was attended by the child's family, project administrators, a UNDPT faculty member, and a State Developmental Center physical therapist. The mother of the child read and signed a consent form prior to the taping session. (Appendix B) The session lasted approximately one and a half hours.

Selected toys were used to demonstrate the techniques using auditory stimulation. Some of the toys used were: a tambourine, drum with attatched tambourine, stuffed frog with beans in it, small balls with bells in them, a football that squeaked when squeezed, a jump rope and stickers. Physical therapy equipment that was utilized were benches, a large high-low plinth, floor mats, physioballs, scooterboard, a "sit fit", a platform swing, and a rockerboard.

A second child was photographed in her home on November 20, 1997. The child's mother was contacted and agreed to allow the child to be pictured two times where it was necessary to have an infant in the prone position and in the supine position. The child's mother read and signed a consent form prior to taking the photographs. (Appendix C)

The pictures included in the manual were taken with Kodak 400 Black and White film. They were taken at the same time as the video was being filmed. The selected photographs were placed in the manual by scanning them with a Silverscan scanner connected to a Power Macintosh. The pictures were modified, cropped, and sharpened using the Kodak Photoshop Program by Macintosh. The photographs were then saved as

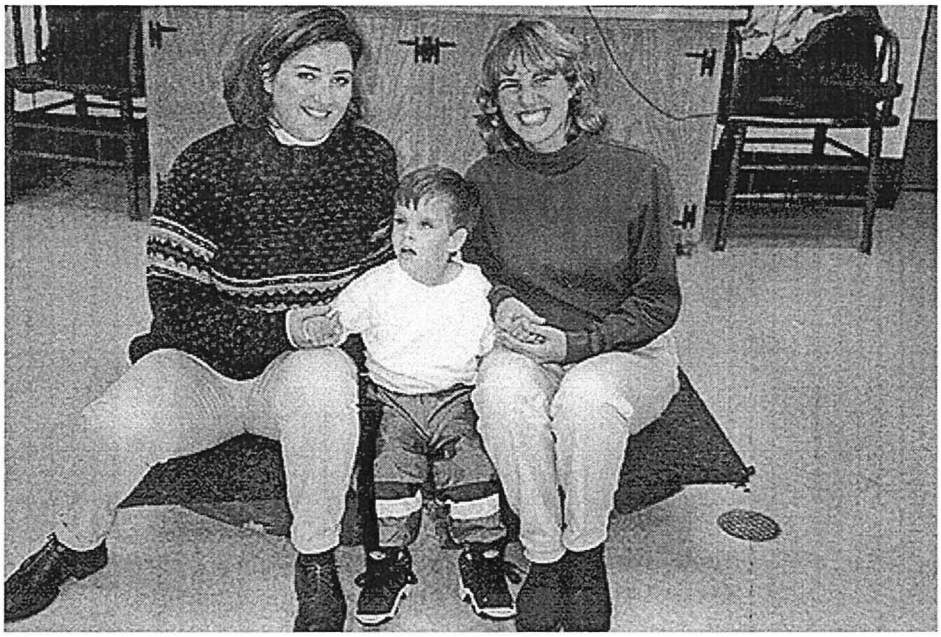
TIFF images and compressed to fit onto standard 1.44 Megabyte computer discs. It was decided that the layout of the manual would be done with the use of Adobe Pagemaker 6.0, a program by Macintosh. This program allows for a professional formatting style with the use of graphics.

CHAPTER THREE

MANUAL OF PHYSICAL THERAPY TECHNIQUES

VISUAL IMPAIRMENT AND GROSS MOTOR DEVELOPMENT

A REVIEW OF THE LITERATURE AND IMPLICATIONS FOR PHYSICAL THERAPY



A MANUAL OF PHYSICAL THERAPY TECHNIQUES FOR CHILDREN WITH VISUAL IMPAIRMENT

BY

JODI TOENJES, MPT

1 An Introduction

While numerous studies have been published regarding visual impairment and its affects income, society, and psychological implications, relatively little has been written about how this impairment relates to physical therapy. What then is the relationship? We would usually expect the rehabilitation or education necessary for a person with visual impairments to function at home, work, or in public to be provided by professionals that specialize in that area, namely Orientation and Mobility (O& M). According to Hill,[2] orientation is the process of utilizing sensory information to establish and maintain one's position in the environment. Mobility is the process of moving safely, efficiently, and gracefully in one's environment. Typically, a physical therapist's goal is to help people to function in their community at their highest physical potential, with less pain and disablity. Seldom do physical therapists delve into the realm of sensory impairment involving the visual or auditory system. However, physical therapists may treat people with musculoskeletal or neuromuscular problems who are also visually impaired. The purpose of this manual is to review the literature regarding gross motor deficits related to visual impairment and illustrate physical therapy techniques that may be applied when treating a child with blindness. There is no difference related to gender regarding incidence of blindness. The suggestions in this manual are directed toward the male population simply because the pre-school aged child that is pictured is male.

A Definition of Blindness

"Visual impairment ranges from total absence of light perception to specified degrees of loss of visual acuity, field of vision, or visual functioning." [3] Having residual vision is when a person is not capable of reading print of any size but has more than light perception. The definition of blindness varies with the type of services received from different agencies. The definition that will be used for our purposes is the educational one because the setting that this manual is designed for is most like that of the school environment. The condition of being "blind" means that there is total absence of light or light reception only.[3] People with only light perception are considered blind as they cannot distinguish the source of the light. An individual with partial vision may use print in learning.[3] The American Medical Association has defined blindness as having 20/200 visual acuity or a visual field of less than 20 degrees, meaning that a person with no visual impairment can see objects 200 feet away with the same acuity that a person who is considered legally blind, can see at 20 feet.[4]

Effects of Inclusion

Historically, children with visual impairments attended separate schools where they received services to develop orientation and mobility skills, general education, and living skills. However, with the onset of inclusion, children with visual impairments joined the sighted students of the public school system. A team approach consisting of an O& M instructor, teacher, occupational and physical therapists, and parents is highly effective in the provision of services as many of these disciplines are interrelated and share intervention methods and information.[2] Public school systems employ the largest number of O& M instructors, however in rural areas an O& M specialist is often only available on consultation basis because of the expense.[5,6]

The low incidence of blindness could be a prevailing reason for the lack of O&M teachers in rural areas.[5] The lack of mobility specialists in some areas has led to *increased* participation of physical and occupational therapists in facilitating sensory skill development, concept development, motor development, and general O & M skills in children with visual deficits.[5]

Incidence and Prevalence

It is difficult to obtain statistics on children with visual impairments in the United States as numbers vary substantially. Incidence can be defined as the number of new cases of a condition within a certain period of time. Prevalence refers to the total number of persons with a certain condition living at any one time. In 1987, the American Printing House for the Blind reported 43,000 children with legal blindness in the United States. That number translates to about 63 per 100,000 children or 1 in 1,400 in the age group 0-17.[7] The leading causes of blindness under age twenty are congenital cataracts, optic nerve atrophy, and retinopathy of prematurity.

Retinopathy of Prematurity. (ROP)
Retinopathy of prematurity is due to the use of high concentrations of oxygen in order to sustain life in premature infants.[8] Oxygen increases the risk of retinal detachment secondary to hardening of the retinal blood vessels. ROP may leave the infant with functional blindness or partial vision. Since the etiology of ROP has been determined, monitoring of oxygen level has increased, and the incidence of blindness has been reduced.[8] It has been speculated that as medical technology continues to decrease infant mortality and increase the number of children born with multi-handicapping conditions, the number of children with blindness will increase. Such a scenario would create a higher demand for qualified professionals to teach children with this type of disability.[7]

Mannerisms

A therapist should be aware of certain activities that have been observed in children with visual impairments. These activities may lack functional purpose and may occur at times of inactivity. A definition of mannerism is "any repetitive or stereotyped movement that is not apparently directed towards the attainment of any clearly discernible goal." [9] Examples of such are body rocking, repetitive hand and finger movements, head rocking, and eye rubbing or poking.

Explanations. Theories for explaining mannerisms vary. Eye rubbing secondary to chronic irritation is a possible physiological cause for this type of mannerism.[10] A theory for eye poking is that it is due to sensory deprivation and is an attempt to produce retinal phosphenes (or to see stars) by putting pressure on the eyes.[11] Body rocking has been explained as a means of providing movement stimulation via muscle receptors, or that it gives the child a means to create an increased awareness of body image.[12]

Problems associated with mannerisms.
These behaviors may decrease time for exploration and learning opportunities, and prevent a child from engaging in play activites with other children.[13,14]

Because many of these activities are socially unacceptable, children may have difficulty in socialization with others. An additional implication is that some types of mannerisms such as head banging and excessive eye poking may be dangerous to the child.[14]

Stability. Brambring and Troster[14] discussed the stability of stereotyped behaviors in a study of children aged 0-6. It was found that body rocking and eye poking proved to be particularly stable. Repetitive rubbing and wiping movements, making faces, sniffing, and the repetitive manipulation of objects disappeared from the repetoire of most children.

Remedial measures. Suggested activities for decreasing the incidence of manneristic behavior are positive reinforcement, giving child a substitute activity, increasing the child's body awareness, and constant reminders or physical cues.[10] Remediation of repetitive behaviors can be challenging, therefore physical therapists should refer to an orientation and mobility instructor for training or information.

Echolalia

Echolalia is a stage that children go through during the process of learning a language.[15] During this stage, children repeat what other people say. This is a means of trying to understand language and communication. Children with visual impairments may remain in this stage longer than usual as they may have an exceptionally difficult time making the transition between speech and communication.[15] Methods of decreasing echolalia are:

- Describing objects and relating them to the child's life rather than naming them.

- Giving the child the opportunity to speak by words and actions rather than anticipating his needs.[15]

Gross Motor Deficits

In the 1960's, several interesting motor problems that accompanied visual impairment were discovered through research. Examples of these are body image deficits, delayed attainment of develomental milestones, poor posture, poor balance, abnormal gait patterns, and general low fitness. [2,4,5,12]

Body Image

Cratty[12] proposed that the development of body image, which is initiated in infancy, may be impeded by the lack of vision. A simple definition of body image is the knowlege of a person's body and how it relates to the space around it. Cratty developed the idea that infants learn about their body image by movement within four distinct areas which he referred to as cones, vertical tubes, finger capsules, and tunnels or arched hallways. In the first trimester, children learn that their arms and legs have areas of space in which they move called cones. The apex of each cone is the joint which connects the limb to the trunk.

Next, the child explores his vertical tube or capsule in the sitting position and later in stance. According to Cratty,[12] there are ten spatial units or capsules of

the fingers which become quite important to explore as the child begins to manipulate objects. Finally, there is a tunnel of space or an arched hallway in which the child moves as he propels himself forwards when crawling or during ambulation.

Children with visual impairments tend to be slow to achieve motion in this tunnel of space because of fear of movement or lack of awareness of objects beyond their immediate grasp.[12] Later in development, body image deficits may be related to difficulties with self-initated mobility in crawling and ambulation, learning left and right, discrimination of body parts, failure to maintain an upright rigid posture, fearfulness of movement, and lethargy.[12,15] Examples of how to address these issues will be provided later in this manual.

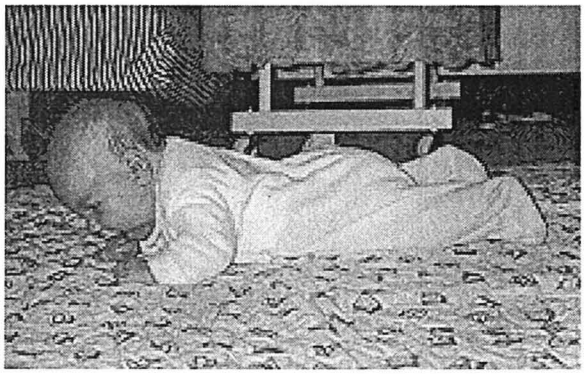
Delayed Developmental Milestones

The cause of delayed attainment of developmental milestones is generally agreed on in the literature. Infants with blindness tend to have a normal pattern of development but at a slower pace.[17] Fraiberg and Adelson[17] compared children with visual impairments with sighted children and found that postural activities that require self-intitiated mobility such as pushing up in prone, pull to stand, and walking independently, were significantly delayed. These activities represent movement that is motivated by visual cues in children with sight. During early development, children with visual impairments suffer from lack of visual stimulation which decreases their interest in the external environment and may also delay reaching skills.[17]

Common treatment methods include using other senses to stimulate movement. An example of this is ringing a bell to motivate a baby to reach for it and roll over. Unfortunately, babies will be slow to respond to auditory lures until object permanence is developed, which occurs in the fourth trimester.[17,3] Fraiberg and Adelson[17] concluded that "prolonged period of immobilization during the first year of life represents a serious threat to the ego development of the blind child." At a time when cognitive and social development are crucial, the child with visual impairment may suffer because of its inability to explore and experience the world.[17]

Prone Positioning. It was also reported that many infants do not tolerate the prone postion as they are unable to clear their heads to breathe or push up with their arms.[17] They do not attempt to raise their heads for any enviromental stimulation. Other authors[18,19] have suggested that balance skills that are facilitated in the prone position may be less developed as less time is spent there. Many educational programs for parents suggest putting infants in prone to promote trunk strengthening, rotation, and crawling.[19,20] See Figure 1.

Figure 1 A baby in the prone position.



Posture

Posture is one of the components examined by physical therapists in treatment of both children and adults. It is agreed upon in the literature that posture is often found to be abnormal in persons with visual impairment, however the causes are variable.[5,12,21]

Hypotonia. Many authors[5,12] found hypotonia of certain muscle groups, and decreased range of motion of certain areas, to be the leading causes of poor posture. Decreased strength of the shoulder girdle musculature, abdominals, and trapezius muscles leads to postural fixes such as contraction of the rhomboids in order to maintain head control.[5] A postural fix of the shoulder girdle may adversely affect gross motor skills regarding long cane use as well as fine motor skills such as precise placement of items on a surface.[5] A classic sign of weak abdominals is an anterior pelvic tilt, increased lordosis, and a rigid posture which is also seen in people with visual impairment.[5] See Figure 2.

Body Image and Concept Development. Cratty[12] discussed the possibility of postural deficits being linked to poor body image and concept development. Lack of knowledge of the location and function of the "anti-gravity" muscles may be a leading factor in "floppy posture." The key anti-gravity muscles are the back and hip extensors. Proper education on how to contract these groups at will, given there is no neurological deficit, should improve posture. The concept of "stand up straight" in a vertical sense may be difficult to comprehend if there are concept development problems.[12]

Fear of Movement. Lydon and MacGraw[21] cited fear of movement and uncertainty of the surrounding environment as a cause for protective postural abnormalities. Decreased range of motion such as decreased flexibility of the shoulder girdle may also be the primary cause of a rigid torso displayed by older children with visual impairment.[21]

Neurodevelopmental treatment. (NDT) NDT has been recognized as a way to develop normal postural reactions and tone.[22] This technique is often used by pediatric physical therapists. Quality of movement is emphasized rather than simply reaching developmental milestones. NDT, as a physical therapy technique, may enhance orientation and mobility through the facilitation of proper posture.[22]

Figure 2 A typical sitting posture. Note posterior pelvic tilt and fixing of upper extremities.

Balance and Gait

Balance and gait deficits have been linked together as they are interrelated and treatment for one may positively influence the other. Hill, Dodson-Burk, and Smith[2] identified profound effects of gait and balance problems that need not occur with proper intervention. A postural fix such as lumbar lordosis may lock the hips in place resulting in a rigid posture. A shuffling wide-based gait pattern may be used to compensate for lack of rotation of the hips and trunk.

A wide based gait and rigid posture undermine the development of balance skills needed to negotiate the environment such changes in terrain, inclines, and declines.[2,5] See Figure 3. In addition, Hill[5] noted difficulty with heel-toe gait patterns and an inability to walk in a straight line, called veering. A stiff hesitant gait, pes valgus, and corresponding balance problems were observed by Jan, Skykanda, and Groeveld.[23] In a study of children, 6-13 years of age, balance deficits were higher in frequency with the younger aged children with blindness as compared to the older children with blindness and sighted children.[24] Lastly, Cratty[12] noted problems with decreased arm swing and an audible slapping gait.

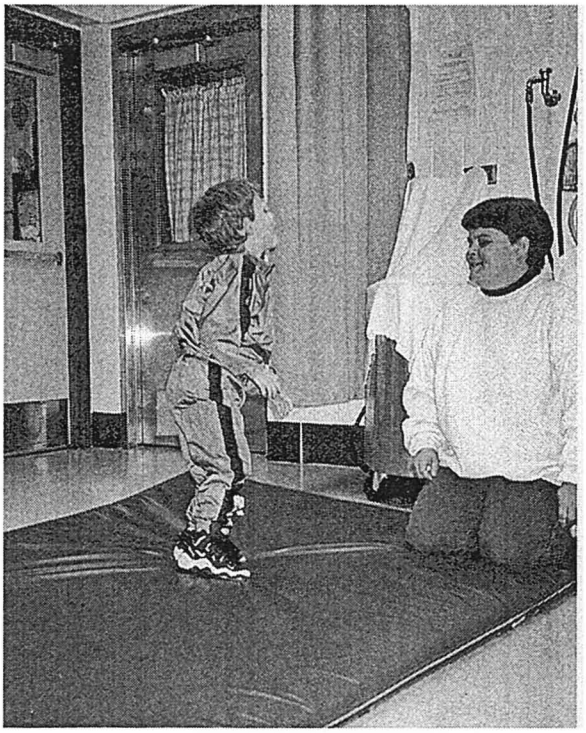


Figure 3 Child walks on mat.

General Fitness

The decreased general fitness of children with visual impairment has been related to decreased activity in physical education programs. Cardiovascular fitness was shown to be less than that of sighted children.[25] Upper extremity weakness, obesity, and low tolerance for exercise was found in a study by Jankowski and Evans.[26] In a similar study of lower extremity function, it was determined that blindness does not cause genuine muscle weakness of the knee extensors but rather that children with visual impairments have lower body weight; contributing to weak

Interestingly, it was found that children with congenital blindness are at a greater risk for hip extensor weakness because of deprivation of activity in the prone position during infancy.[27] Children who are motivated to exercise daily benefit in the areas of balance, strength, and proprioception. In addition, greater experience in gross motor movement gives children greater confidence in gross motor tasks. [28]

2 Residual Vision

Before the intial treatment of a child with visual impairment in physical therapy, it is important to be prepared to treat them and to be knowledgeable in techniques that will allow for an effective treatment. This section will address the subject of residual vision and discuss information that the therapist should be aware of regarding the child's functional vision.

Information Please!

Prior to the intial treatment session, it is necessary to find out the amount of functional vision the child has. It has been reported that 75% of children considered legally blind have some amount of usable vision.[28] In order to be an effective therapist, it is important to modify treatment techniques according to how much vision a child has. There are three sources of information that will help assess how to better accomodate to the child.

Physician

The following information pertaining to visual function should be located in the medical record.[29]

- Nature and prognosis of eye condition
- Medical treatment, correction, and management
- Documentation for service eligibility
- Other problems associated with vision problems
- Type of lighting best for child
- Particular behaviors that would indicate a need to contact further medical attention
- Restrictions on activity
- Frequency of examinations

Parents/Family

The family is the most knowledgeable regarding vision concerns or patterns specific to this child.[29] Critical information they can provide is related to:

- How child responds to visual stimuli
- Nature of visual stimuli
- Patterns of alertness
- Preferred body positions

Resource/Itinerant Specialist

The resource/itinerant specialist ensures that the proper adaptive devices are available so the maximum amount of functional vision can be utilized.[29] Examples of the type of information provided by the resource/itinerant professional are:

- How to best work with a child during treatment
- Instructional and environmental adaptations
- Resources, equipment, and materials to better incorporate educational needs
- Interpretation of medical information

Observation of children during treatment will enable the therapist to better understand how they use their vision during regular activity. Three objective activities may be incorporated to determine how the child best utilizes his residual vision. These objectives are: visually directed reach, viewing posture, and use of touch.[30]

Visually Directed Reach

When examining visually directed reach, the therapist observes how well the child can reach out for an object or, if they can walk, how well they walk towards an object using their vision to guide them. Four components to consider are accuracy, confidence, fluency, and speed.[30]

Viewing Posture

The next activity is examining the viewing posture of the child. Often children with low vision will hold an object close to their faces, tilt their heads, or hold the object near or away from a source of light to better view the object.[30] When examining viewing posture, things to consider are the position of the eyes (use of both eyes, central vision, or peripheral vision), position of head, viewing distance, and length of time in exploration.

Central vision problems may cause the child to avoid tasks with small objects, hold objects closer to their faces, and have difficulty with color discrimination.[31] Treatment implications would be to display matierials at a viewable distance, enlarge items, increase illumination, and decrease glare.

The child with *peripheral* vision problems may trip or appear clumsy, have unusual head positions or movements, be unable to find lost objects, and have slow light and dark adaptation.[31] Treatment techniques are to make the target smaller so that the child may view it with their central vision, teach scanning skills in order for the child to look for lost items in the periphery, teach the child to use sense of touch when scanning environment, and position child so that he is directly facing the target. Decreasing glare is equally important with peripheral vision problems.

Use of Touch

Lastly, use of touch should be assessed.[30] The factors to assess are the following:

- Does the child reinforce what was viewed by use of touch?
- Does the child locate objects by touch before viewing?
- Is it necessary to use a combination of vision and touch, or soley vision to determine the identity of an object?

Additional Factors

Additional factors that contribute to functional vision that may facilitate your base of knowlege regarding the child's visual capability are:[28]

- Use of vision for tasks of daily living
- Convergence of gaze: ability to turn eyes inward when looking at close range. This is related to the child's ability to focus on an object close to him.
- Visual tracking: ability to follow a moving object
- Visual field: use of central vision for detail and peripheral vision for detecting gross movement
- Function in dim light
- Auditory distractibility
- Visual-perceptual skills (matching, sorting)
- Effects of medication on visual function

3 Environmental Adaptations

Adaptations can be made to the environment, depending on how the child uses his residual vision. This section will cover glare, color, toy selection, figure ground, and landmarks and clues.

Glare

There are two types of glare, discomfort and veiled. Discomfort glare does not interfere with how well a child can view something but rather causes discomfort or even pain. Glass or mirrored tables, furniture with a high gloss or polish, white countertops or even paper may reflect sunlight and cause discomfort. The second type of glare,veiling glare, may inhibit the child's ability to view an object, but does not cause pain.

Becoming aware of objects that may cause discomfort will increase treatment effectiveness. If the child becomes irritable without an obvious cause, it is helpful to determine if something in the environment is causing discomfort glare. For example, brighter lighting may allow some children to discriminate details with greater ease. However, children with cataracts or albinism are negatively affected by brighter lighting because of discomfort glare.

Room design and function may result in glare problems. Bathrooms have a tendency to create a large amount of glare because of the enamel, tile, mirrors, and flourescent lighting. Awareness of objects that are sources of glare, along with taking steps to minimize glare will enhance the child's use of residual vision. For example, keeping the indoor lights on during the day has been recommended to equalize lighting from outdoors and indoors. Natural sunlight causes both veiled and discomfort glare.[32] Eye conditions that cause sensitivity to glare are cataracts, glaucoma, albinism, and retinities pigmentosa.

Color

People with low vison require about three times the normal amount of light to distinguish colors compared to people with normal vision.[32] Violet, navy blue, and black are easily confused and pastels may appear white. Consider using brilliant colors to enhance treatment interest. Single color schemes may cause orientation difficulty, for example; a blue mat on blue carpet. It is recommended that contrasting colors be used during treatment. Black and white has been recommended as the best contrast. Yellow is the most visible color.[31]

Toy selection

For many children, the type of toys they play with determines whether the treatment is effective, fun, and worthwhile. When selecting toys for treatment, consider multi-sensory input, real life application, and complexity.[33] For example, use toys that are textured such as stuffed animals, or balls that have special coverings such as basketballs or footballs. Toys that make sounds enable the child to utilize his auditory sense to determine location, speed, and identification of the object. Examples are an audioball that beeps, a balloon filled with rice, and a toy that makes noise when squeezed. Musical instruments such as drums or tambourines may also be used. Incorporate the olfactory sense by using scratch and sniff stickers or other scented toys.

To help the child understand the world around him, give him the opportunity to play with everyday objects during therapy. For example, incorporate toys with keys and locks, let the child open and close windows, and manipulate small tools, This facilitates the child's understanding of real life concepts.[33] When dealing with miniature items, stress the importance that the actual size of the real object is larger, in order to assist in spatial development.

Lastly, the complexity of toys is an issue that cannot be understated. Children prefer to play with toys that are challenging and offer maximum opportunities.[33] Complex toys have many colors, larger surfaces (greater than one foot in size-such as a platform swing), many edges, moveable parts, and are manipulable. Examples are swings, ladders, boxes of asssorted shapes and sizes, and water. [33]

Figure Ground

An example of figure ground is the difference between the ability to see an object such as a marble on patterned carpet as compared to a marble on plain carpet. Figure ground is also called clutter which is related to visually stimulating or busy backgrounds.[32] Individuals with low vision will identify objects with more ease against plain backgrounds. Adding stimulating patterns to toys may be necessary for the child to see the object. See Figure 4. Clear the treatment area of unnecessary items to avoid distraction.

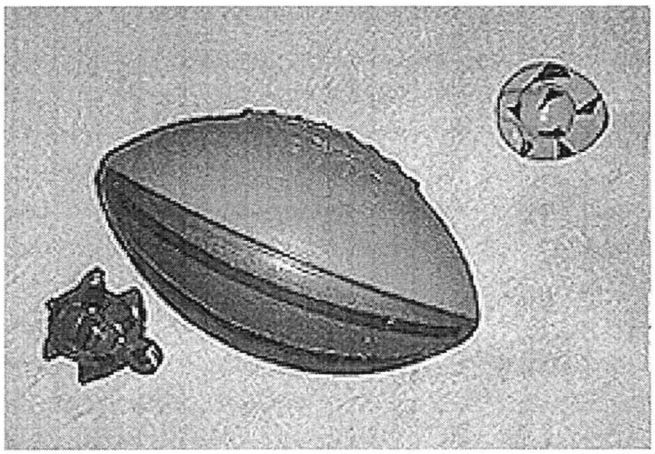


Figure 4 This picture is an example of toys that are made visually stimulating through the use of patterns.

Landmarks and Clues

It is helpful to incorporate landmarks and clues to ease the orientation to a new environment. If the child will be coming to the physical therapy regularly, showing him landmarks in the progression from classroom to the physical therapy area will help to make the child comfortable in new surroundings.

Landmarks are fixed objects that can easily be recognized and have a permanent location in the environment.[32] Some examples of landmarks are doors, rugs, a ticking clock, a window, things a child can see, feel, or hear. A child with low vision may see a shiny doorknob and know it is a door, while a child with no usable vision may hear a door open and close or feel the smooth wood and doorknob to identify it.

A clue is a recognizable sensory stimulus that can help identify a person's location.[32] Clues differ from landmarks in that they are not permanent or fixed. Examples are sounds of a drinking fountain when it is running, traffic at an intersection, the smell of a bakery, or different air currents or temperature in different areas of a building.[6,32] The child should be made aware of the clues and landmarks to facilitate independent mobility.

Orientation to Indoor Setting

To facilitate ease of transition into the physical therapy environment, help the child to orient himself with certain items or areas. For example, begin at the door and let the child feel its texture, the handle, etc. Proceed to a landmark in the room such as the toy shelf or box. The child may then examine some of the items, while the therapist explains activities that occur in that area. Consistently doing certain activities in designated areas gives the child a sense of structure and enables the child to be prepared for that activity.[31]

After exploring an area, return to the door. Next, walk to another area with a landmark such as stairs, allow the child to go up and down the stairs, if able. In this way, the child may understand the number of stairs and where they lead. Again, return to the door, continue in this process until the general area and landmarks have been explored.[34] Other landmarks to teach the child are the location of exercise mats, swings, and other doors.

Allow the child to explore the outer edges of the room to get a feel for the size of the area. If the child is able to see bright colors or recognize light coming from windows incorporate these into orientation.

Tactile cues must be included in the orienation process. For example, changes in floor surfaces are of great assistance in determining location.[31] Tile flooring, such as that in bathrooms, differs significantly from linoleum, wooden floors, and carpeting. The child should be made aware of these changes. It is important to orient a child with visual impairment to variations in floor planes such as a ramp because the child may not be familiar with such objects and coincidentally would be fearful to negotiate them.[31] If the child is able to read large print or braille, such signs should be placed near stairs, ramps, and doors.

Environmental Safety

Safety is always a primary concern when working with children with visual impairments. In the physical therapy environment, adaptations can be made to decrease the risk of injury.[6] Stairs may be marked with brightly colored tape to assist with depth perception and to identify their location. Tape is placed on the edge of each step. Doors should remain completely open or closed, never partially open. It is necessary to inform and reorient the child when there is a change in the layout of the room.[6] The child should be familiar with locations of objects that are easy to trip on such as mats, bicycles, and low benches.

Protective techniques and trailing

In areas such as hallways, children with visual impairment may use protective techniques such as holding their arm up and in front of their face to keep from walking into obstacles.[32] Another activity, trailing, is used to follow a wall, find a doorway, and develop an internal "map" to better understand the layout of a building. Indoor trailing is the action of following the wall with the dorsal surface of one hand. This can be done with cabinets and counters. See Figure 5. When the child reaches an open area, auditory clues of approaching footsteps can help determine his location.[32]

If the child is demonstrating these activities in other environments, encourage him to do so in the PT area as well. O&M instructors will assume responsibility in teaching these techniques as the child matures. As the child gains integration of body image, various positions should become easier to assume. Physical therapists can reinforce these skills by becoming educated in these techniques and incorporating them in therapy.

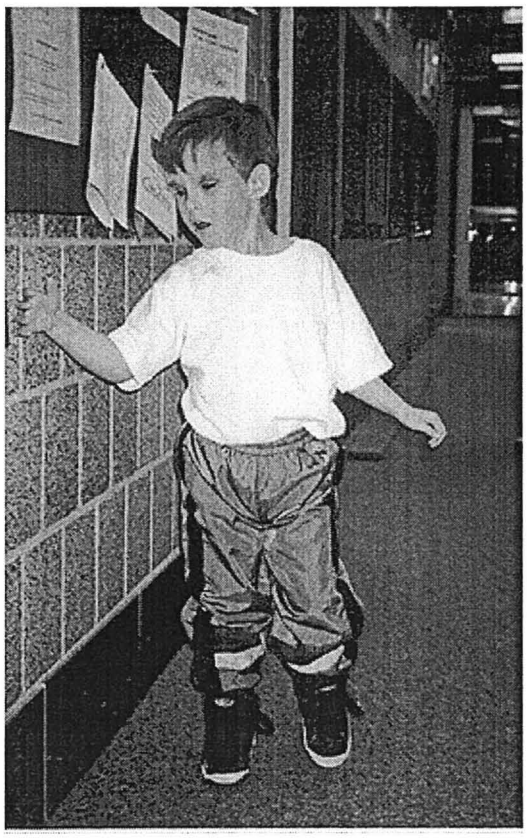


Figure 5
An example of trailing along a wall.

4 Physical Therapy Techniques

This section will address the motor deficits related to visual impairment that have been discussed thus far. Treatment suggestions from a variety of sources as well as original ideas are given. Body image will be discussed first as problems related to poor body image begin to develop during infancy.[12]

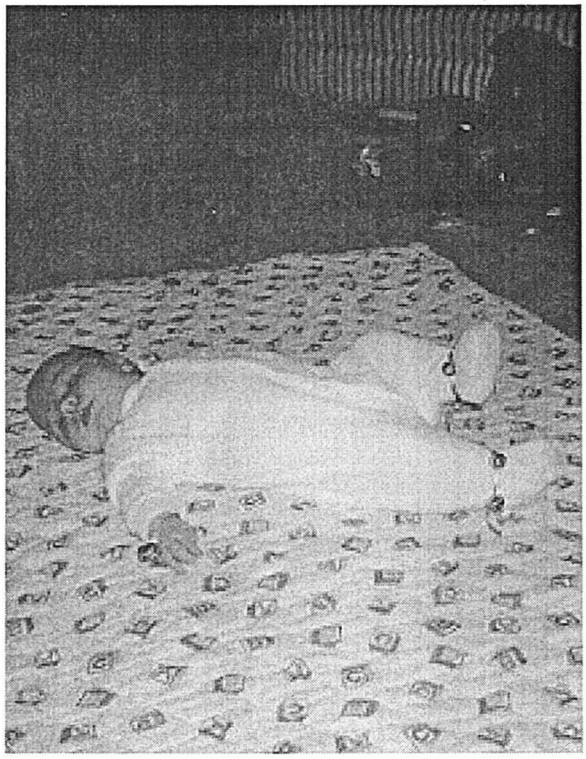
Body Image

In the first eight to ten weeks of life, the child is beginning to move his limbs in the "cones of space".[12] To facilitate exploration of these areas, a parent or therapist may hold the wrist or the ankle and move them in circular patterns throughout the range of motion. This will increase input from the proprioceptors in the joints, such as the hip or ankle, to help determine limb location.[12] During range of motion, the therapist may rub the child's limbs with soft textured material which can assist the child in learning the outline of his body. As the child gets older, tying bells to the child's shoelaces or wrists will help him to associate movement with sound and will stimulate the child to move.[19] See Figure 6.

Figure 6 Child with bells on her ankles and wrists to facilitate increased awareness of body image.

The child may need assistance to assume positions in quadruped, sitting, and standing. Body image develops as the child explores the space around him. Vertical tubes and arched hallways are the terms Cratty[12] uses to describe the space the child moves in when sitting, standing, creeping, and walking.

Body parts, movements, planes. When the child approaches the age of two, body part recognition should begin to be integrated. The child learns body parts in a proximal to distal manner. For example, facial features such as eyes, nose, and mouth are usually first to be recognized (the upper extremity is before the lower extremity). The joints which bend such as the knee are easier to identify than the thigh.[12]



Planes of the body such as the front, back, and side of the body are more difficult to learn.[12] Games in which the child is asked to place objects so that they touch his front, back, or side can help the child to learn this concept.[34] The top of the head and the bottom of the foot should be included in such activities. Some examples of games that focus on body parts, movements, and planes are:

Simon says

The child is asked to follow such directions as "Simon says...bend your elbow, touch your nose, wiggle your toes." Be sure to give enough verbal cues so that the child is able to follow the directions. Positive reinforcement will help the child learn the correct movements as well as make this game worthwhile.

"How can you move so that?"[35]

Directions are given to improve spatial relationships and identify body parts. "How can you move so that the bottom of your foot touches the wall? or ...so that your side is touching the mat or ...so that your fingers touch the sky?"

Head, Shoulders, Knees, and Toes

This song/game facilitates body part identification as well as deep knee bends. The child and therapist sing the song while the child touches each part, additional parts can be added as the child is able to identify them. To make this activity more fun, the child can sing while the therapist does the actions, and then the therapist can sing while the child does the actions. See Figure7.

Naming body parts[35]

In this activity the therapist names a body part and the student puts a sticky piece of tape on that part either on himself or on the therapist.

Laterality. Laterality is the distinction between left and right., This can be a problem for children with blindness.[12]

- Activites such as placing objects on one side of the child and asking the child to identify which side the objects are on can help enforce this skill.

- Wearing a ring or watch on the same side during treatment will give the child a permanent reference.

- General instructions during treatment such as "raise your right hand" will help to train the sense of laterality.

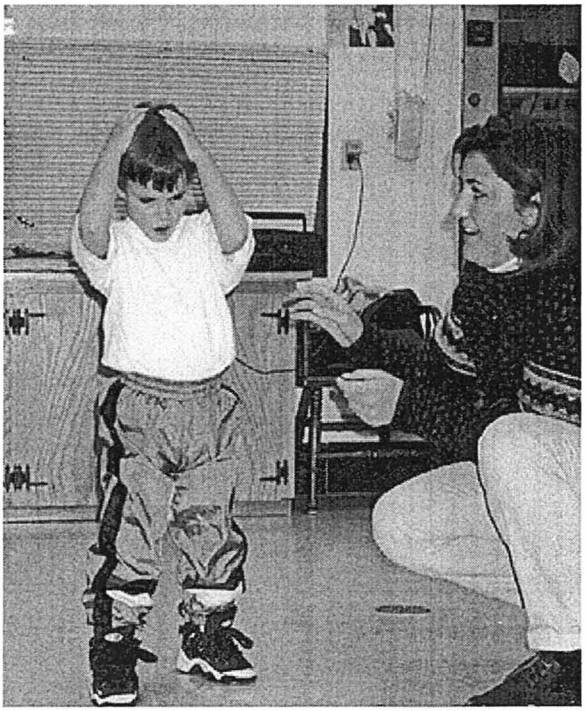


Figure 7 Child points to head during "Head, Shoulders, Knees, and Toes".

- Games involving stepping three times to the right and two times to the left can help promote understanding of the concept of laterality as well as work on gross motor skills.

- If the child is able to write and is right or left hand dominant, this will help him determine laterality.

- Actions such as saluting the flag in which the child puts his hand over his heart should be taught and can help reinforce this skill.[12]

Directionality. The meaning of concepts such as above/below, in/out and top/bottom and forwards/backwards can be reinforced during daily activities.

Getting *up* in the morning, going *up* and *down* the stairs, putting toys *in* a box, are all examples of using terms of directionality. Avoid using terms such as here or there as the child can't see which way you are facing or pointing.[36]

In and Out

An activity to teach the concepts *in* and *out* is to have a box full of plastic balls, help the child climb *into* the box and throw some balls *out* of the box to the therapist by following her voice. This incorporates concepts of directionality, throwing skills, and auditory tracking. See Figure 8.

Obstacle Course

An obstacle course involving climbing *through* a barrel, weaving *around* some cones, walking *over* a balance beam, on *top* of a trampoline, and walking *up* and *down* the stairs would work well with a fairy tale such as Little Red Riding Hood and her trip to grandmother's house. See Figure 9. This facilitates crawling, climbing, walking, as well as increasing the child's knowledge of concepts. Use familiar and unfamiliar objects to teach size, shape, and function.[2] It is helpful to provide a means for the child to find his way through the course. For example, you may use a rope that he could follow or position the course along the edge of a wall or mat to permit trailing or tactile guidance.

North, South, East, West [35]

As the child learns these directions, they can be incorporated into treatment when working on gait activities. The child should be oriented to which direction the room faces, i.e. the door is on the south side of the room and the window is on the east.

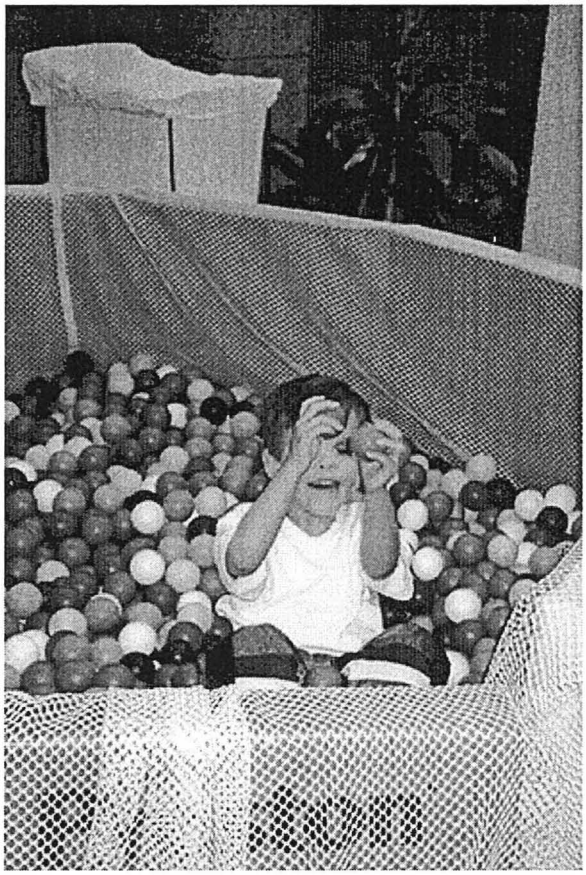


Figure 8 Child plays in box of multicolored balls.

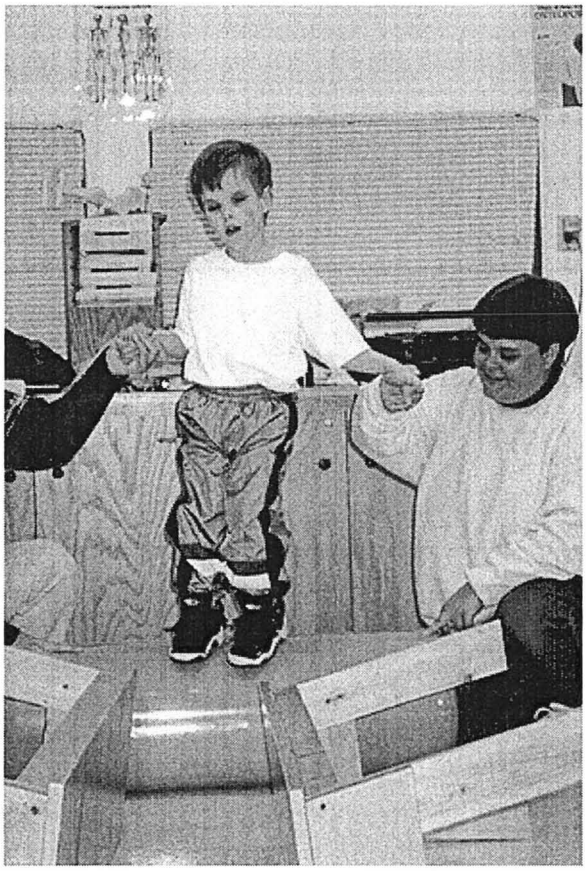


Figure 9 Child negotiates obstacle course.

In summary, body image awareness begins in infancy. Helping the child to explore what their body is capable of doing and ways they can move will help the child to be less fearful of trying new actions. Frequent repostitioning is necessary so that the child will recognize how it feels and it will become more comfortable for them. This is especially important with prone postitioning. As the child matures, learning body parts, how they work together to accomplish coordinated action, and the understanding of laterality and directionality are imperative to the development of gross motor skills.

Delayed Milestones

Certain milestones have been identified as occuring at a slower rate in children with visual impairments as compared to children with sight. Some of these are pushing up in prone, pull to stand, crawling, and walking, all of which are self initiated activities. Treatment activities to facilitate theese skills are very similar to the general pediatric population.

It is important to pay attention to quality of movement as well as reaching developmental milestones.

Rolling

The use of vision is one of the primary factors in reaching rolling milestones at the appropriate time.[17] A child with sight may visually track an object while on his stomach. As the object moves further laterally, the child's arm and leg on that side will extend at the same time as the trunk muscles that assist rolling contract; this enables the child to roll from prone to supine. Children without sight progress through this stage at a slower rate because they lack the visual stimuli that facilitate this activity. Therefore, it is recommended that a child with a visual impairment be assisted in rolling several times a day.[34]

□ □ □ □ □ □ □ □ □

Prone

During infancy, children should spend time in the prone position even though they may not enjoy it. The benefits of the prone position are far reaching in that deficits in ambulation, balance, and posture may be related to the lack of time spent in this position.[27] This position promotes head control by strengthening the neck, upper extremities, and trunk musculature. The child may prefer to lie over a pillow on the therapist's or parent's knee. The neck musculature may be facilitated by stroking and tapping. Auditory stimulation will be most helpful during the fourth trimester, when object permanence has been developed. [17]

Reaching

- Hanging toys on a mobile above the crib yet within grasp can facilitate reaching. Rattles with bells, squeeky toys, or a busy box are suggestions that may stimulate a baby's interest. [20]

As the child is learning to use and integrate all of his senses, it is important to verbalize what you are doing. In this way, the baby will become familiar with your voice. The dual sensation of feeling the movement as well as hearing you speak about it may help him to understand.[36]

Sitting

Children with visual impairments usually achieve sitting milestones at the same time as the sighted population.[33] However, some children may show decreased trunk stability in this position, resulting in either a posterior pelvic tilt with thoracic kyphosis or an anterior pelvic tilt with a retracted scapula.

Some activities to improve sitting posture are listed below.

- Facilitation of both the abdominals and back extensors promotes a neutral spine in the sitting position.[34]

- Physioball activities - concentrate on weight shifting and postural protective reactions. See Figure10.

- Boster or swing activities. These activities will stimulate the vestibular system, assisting in sensory integration.

- Approximation of the shoulders and head may facilitate increased muscle tone and improve posture.

Figure 10 Child sits on ball and reaches forward to improve sitting posture.

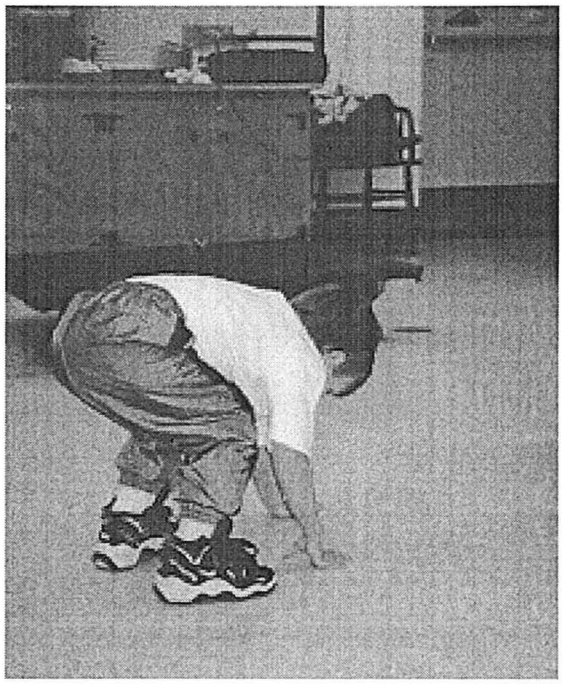


Figure 11 Floor to stand transition.

Transitions

Children with visual impairments may have difficulty with self intitiated mobility or moving from one position to another.[17] Activities such as pull to stand, crawling, and walking involve many components. Weight shifting, rotation, stability/mobility, and righting equilibrium reactions are components of the process of changing positions.

A therapist must determine which component may be the cause for the delayed attainment of transitions.

Repeated movement from position to position will help the child become more comfortable and independent. See Figure 11.

Activities to promote skill in changing positions are:

Using Music

Counting rhythmically to the beat of music may help the child use his auditory system to assist coordination of movement and smooth progression.

Pattycake during Sit to Stand

During sit to stand transitions, the child must shift their weight forward which can be a challenging task if they are fearful. Having the child play pattycake with the therapist sitting in front of them may enhance a feeling of safety. As the therapist moves farther back, the child must shift his weight forward to continue clapping the therapist's hands.

Beat the Tambo

Reaching forward from a seated postion can also be achieved by holding a musical toy in front of the child and having them reach forward to play it. It is necessary to use an instrument that the child can hear so that he may use auditory tracking to find it. See Figure 12.

Figure 12 Child reaches forward to hit tambourine.

Creeping Activities

It is not unusual for a child with visual impairment to be hypotonic. In the quadruped position, a hypotonic child would tend to be in a lordotic posture, with protraction of the scapula, and hyperextension of the elbows.[33] Facilitation of the pelvic and shoulder musculature may be utilized in order to break up abnormal postures and promote creeping. A child with visual impairment may tend to rock back and forth in the quadruped position for several weeks longer than normal before moving forward independently.[17] Physical assistance may be required to help the child coordinate the weight shifting and rotation that are necessary. Motivating the child to move forward may be the most important factor in attaining goals of creeping. The following activities are suggested to promote creeping.

Safety Mat

Making the child feel safe in his environment may be a factor related to delayed attainment of creeping milestones. If the child knows that whenever he is on the mat he is in the "safe zone," he will be more inclined to move.

Bucking Bronco[33]

One activity that facilitates movement in the quadruped postion is putting an object such as a stuffed animal on the child's back. He is then told that the toy is a "cowboy" and his job is to give the cowboy a ride like a pony. See Figure 13. An activity to increase dynamic trunk mobility and pelvic tilting is to tell the child he has to buck the toy off, like a wild horse. As a child with visual impairments has probably never felt, heard, or ridden a horse, the therapist may demonstrate by having the child feel them move or even giving the child a ride on the his or her back. This activity increases muscle tone in the back, upper, and lower extremities. It also increases rotation, neck extension, and pelvic tilting. Remember that broncos make noise!

Audioball

An audioball is a ball that beeps periodically. When placed just out of reach of the child, it may motivate him to creep towards it and then push it towards the therapist. The child must realize that this is an attainable goal in order for him to be motivated to attempt it.

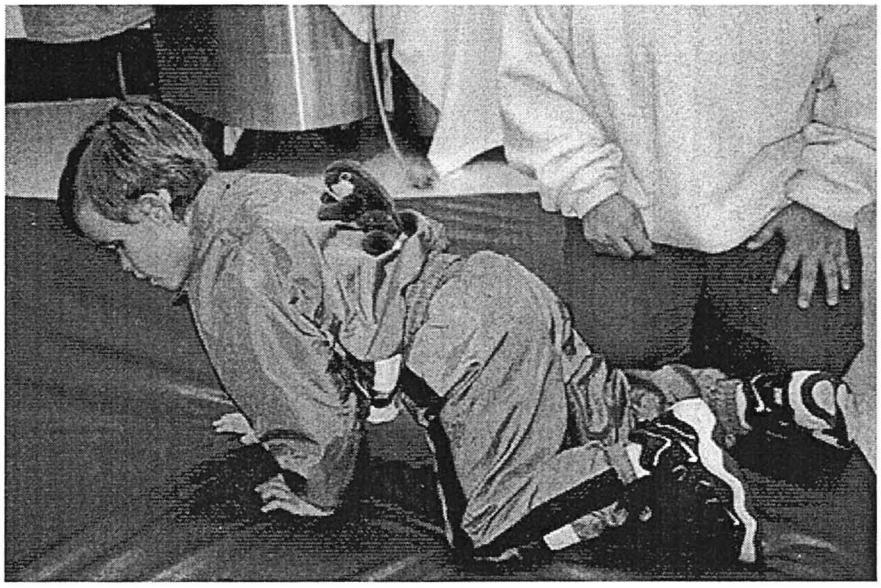


Figure 13 Child gives stuffed frog a ride on his back in order to facilitate creeping.

Bear Walking

Creeping patterns, such as bear walking, concentrate on reciprocal movement, coordination, and strength. Another benefit of bear walking is active hamstring stretching. Again, the child may need to feel the therapist do this movement to help him understand it.

Cruising

The therapist can promote cruising by assisting the child as he pulls himself up on a physioball. He is then able to cruise by pushing against the ball as the therapist gives equal resistance to the ball.

Walking

A child may be fearful of moving into open space causing delayed attainment of ambulation milestones. Giving a child a push toy increases his stability and may provide incentive for taking steps.[32]

Posture

There are many deficits to overcome in the correction of posture. In the general population, education is needed on what proper posture looks like and how to assume that position.

Often muscle groups such as the abdominals, neck extensors, and scapular muscles are weak from disuse and need to be strengthened in order to develop good posture.[12] Maintaining proper posture takes awareness of the position of the spine during activity and at rest.

When dealing with persons with visual impairments, it is necessary to determine the cause of poor posture. Hypotonia, poor body image, and fear of movement have been cited as possible causes. It may be more difficult to change postural habits in this population as the etiology must be resolved.[34]

William Cady,[21] a registered physical therapist, suggests some activities to promote proper posture. In his observations of children with blindness, he determined that there are certain postural faults common to this population.

Some of these are increased flexion of the head, kyphosis of the upper spine, weak abdominals causing lumbar lordosis, tight hamstrings, and pronated feet.[21] Essentially, the literature has identified several areas of postural deficit that physical therapists are qualified to address.

Figure 14 Child balances toy on his head to improve posture.

Suggestions by Cady[21] include:

- Balancing objects on head to promote neck extension and retraction. Small boxes filled with objects that rattle such as beans or rice may give extra sensory input to help facilitate head control. See Figure 14.

- Wand exercises such as holding a wand in front of the body, raising it, and placing it behind the shoulders without changing head position. The objectives are to decrease protruding head and kyphotic thoracic spine. It also promotes scapular mobility.

- Partial sit-ups for abdominals beginning with arms at side, progressing to arms behind neck. This can be made more appealing by placing a musical object at the child's knees just out of reach so they have to come up and tap the toy to make it play. A drum would work well and the child could hold a drum stick and beat the drum one time for each sit up. The child would need to know where the drum was so he would not have to search for it.

- Head and shoulder raises in prone promote back extensor strengthening. The child may pretend he is "Superman" or "Wonder Woman" and is flying through the air. See Figure 15.

Additional activities are:

- Physioball activities in kneeling. This skill promotes a smaller base of support, and facilitates co-contraction of the back musculature and abdominals.

- Approximation of the head and shouders facilitates increased tone of back and neck stabilizers.

Body awareness. Teaching the child which muscles he needs to contract to maintain proper posture may help him to stand up straight. Facilitating the extensors by tapping or stroking them may give the child input as to where these muscle groups are and their purpose. Having the child palpate another child or the therapist who is displaying poor and then good posture may help him understand the importance of proper posture and make it meaningful. Be sure that the child understands the concept of "stand up straight" in a vertical sense as this may need to be taught.[12]

Figure 15 Child doing push ups.

Balance

A helpful technique to improve balance and gait is to give the child the opportunity to move in a safe environment. Removing the child's shoes increases tactile input about the type of surface beneath him.[31] Varying the surface such as grass, sidewalk, gravel, sand, steps, hills, and ramps will improve balance. It is recommended to give verbal cues often when coming to obstacles such as curbs. It is important to maintain the child's confidence so that he is willing to try new things.

Good balance is imperative to stability in gait and safety in the environment. Some activities to improve balance are:

Elevator game to music[34]

The child and therapist face each other, holding hands. They bend their knees doing a deep knee bend to the beat of the music. See Figure 16.

Rocker board

This activity challenges dynamic balance. It is important to let the child feel the borders of the rockerboard, and to feel it rocking, before he stands on it. To add creativity, he can imagine it is a boat on stormy seas. The child can assume any position. See Figure 17.

Wobbly cushion

An activity that challenges static balance is the "sit fit" cushion. These cushions are usually used for training sitting balance in order to facilitate abdominals and back extensors. However, when standing on this object, the child must strive to maintain static balance. See Figure 18.

Reach for the sky!

This activity concentrates on posture, two legged balance, and strength. The child is asked to raise up on his tip toes and reach for the sky. A motivating object can be placed just out out of reach so that he is motivated to reach for it (a balloon filled with rice is such an example). Ideally, the child would hold the position for a certain amount of time, such as 5 or 10 seconds. This activity may progress to tip-toe walking.

Roller skating

A challenging, dynamic balance activity is roller skating. At first, the child would need to hold onto the therapist's hand and trail along a wall for security. Later the child may progress to holding onto a rope held by the therapist.

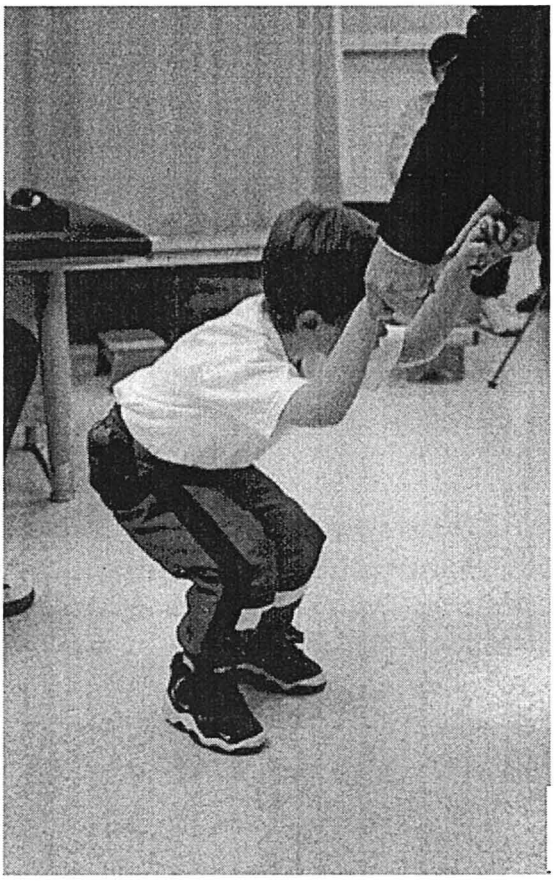


Figure 16 Child demonstrates a deep knee bend during the elevator game.

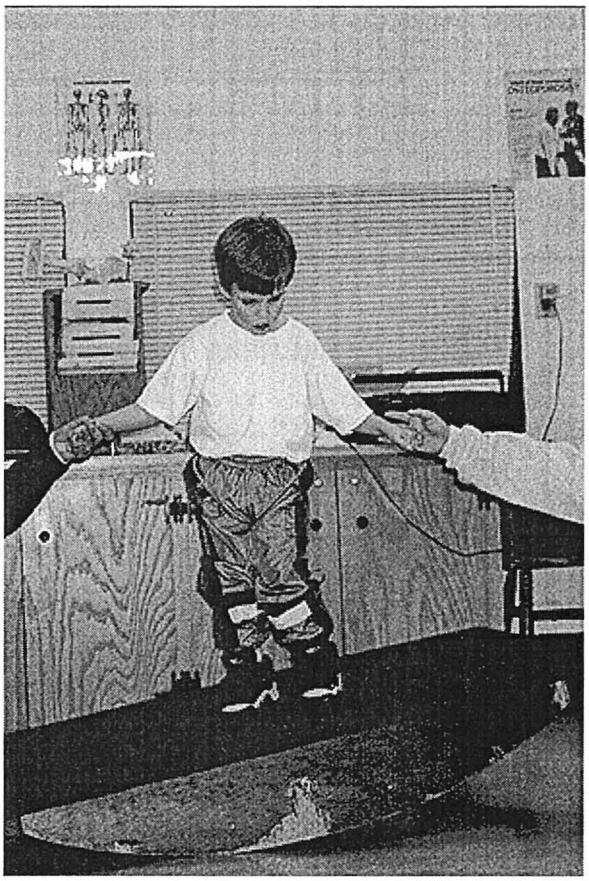


Figure 17 Rocker board activity in standing.

One Legged Balance

The ability to maintain balance on one leg is important in kicking activities, walking up stairs, and during regular ambulation. Activities that promote unilateral balance are:

Step ups

A toy that can be squished, such as a ball, is used for this activity. The ball is placed in front of the child's foot. The child places one foot on top of the ball for 3 seconds and then squishes it. A squeeky toy makes this game motivating. An important objective is to make sure the child holds his foot on the ball for a certain amount of time before stepping down.

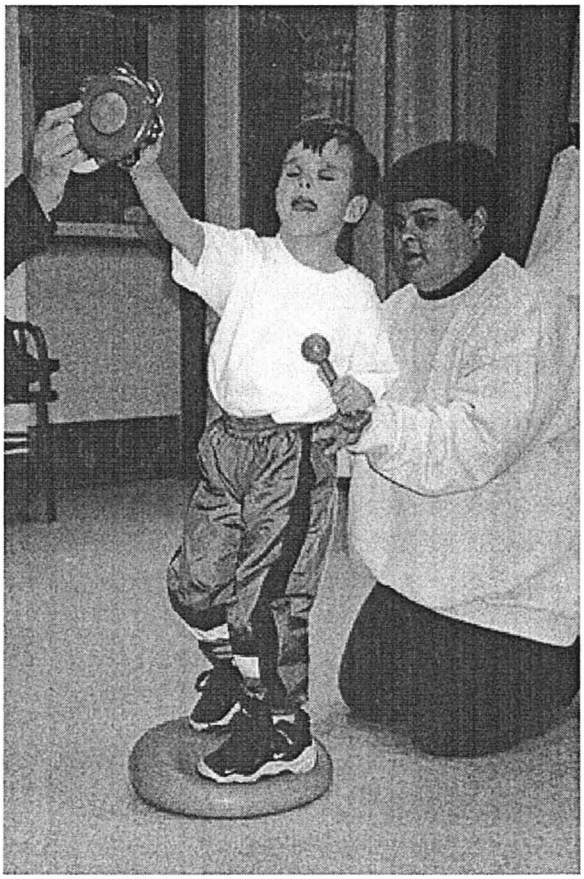
Kicking activity

Using a ball or toy that makes noise is motivating when facilitating kicking activity. The objectives are to increase strength, coordination, and balance.

Gait

As mentioned earlier, several deficits in gait have been noted with this population. The first that will be addressed is arm swing. Normal gait involves reciprocal movement of the arms. Children with visual impairment may have decreased arm swing secondary to decreased scapular mobility or immature body image.[12] Activities to improve arm swing are knee walking and swinging the arms while standing.

Figure 18 Whoa! Child finds it difficult to maintain upright position on cushion.



Knee walking[12]

Knee walking is an activity in which it is necessary to use increased arm movement in order to gain momentum. The child may still hold his arms close to his body because of insecurity or habit. Providing verbal cues and helping his arms to feel the movement may assist integration.

Reciprocal arm movement

Having the child stand still and only move his arms may assist understanding of arm swing. Using a toy that makes noise as air runs through it would make this activity fun. Using music and swinging arms to the beat, or having a drum in front and behind the child would also be motivating. Emphasize keeping the elbows extended and avoid pronation or supination.

As many children ambulate with a wide base of support, some suggestions are given to facilitate a more normal gait pattern.

Tandem walking

The child walks along a line that he can feel with his feet. For example, a plastic jump rope, or air bubble paper that pops as the child steps on it could be utilized. Balance beams may be used if the child feels comfortable with them.

Around the Innertube

A larger innertube is needed for this activity. The objectives are to improve dynamic balance and narrow the base of support. The child walks in a circle, on the innertube. It may help to place a large physioball in the middle of the tube so the child will feel more secure and can fall into it if necessary.

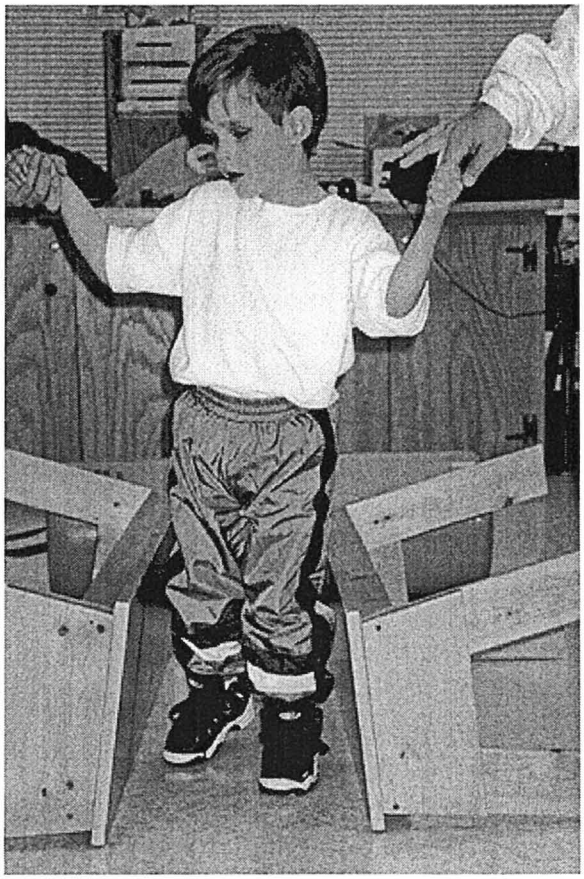
Obstacle Course

Again, an obstacle course can be used to facilitate a narrow base of support. Two boards, mats, or benches are placed close to each other and the child walks between them, the mats may be the "water zone" and should be avoided. See Figure 19.

Lilypads

Longer stride length can be promoted by placing textured mats, such as carpet sections, one to two feet apart. The child feels for them with his toe and steps from mat to mat. This activity incorporates balance and sensory integration.

Figure 19 Child walks between boards to decrease his base of support during gait.



Marching to music

Marching is a skill that can be taught as the child begins to learn coordinated gait patterns. Music is a fun way to teach this task, counting may also be needed.

Galloping and Skipping

Galloping and skipping are skills that are integrated by five to six years of age in the child with sight.[22] As the child nears this age, these patterns should be added to his treatment program. Because these are highly visual tasks and learning relies on watching others do the activity, these could be delayed. Rhythmic counting may be utilized to assist. Holding the child's hand will be necessary at first for him to feel the rhythm.

Running is a skill that is necessary for all children to learn. It utilizes coordination, balance, strength, and improves cardiovascular fitness. It is used in many games for children of all ages.

Running with a jump rope

The child will feel more secure if they know that the area is clear of obstacles and that they can trust the therapist not to let them run into anything. The child should be oriented to the size of the room so that they do not fear hitting any walls or tripping on mats. At first, the child may hold the therapist's hand when running. Later, the child may progress to holding onto one end of a jumprope while the therapist holds the other. See Figure 20.

Physical education programs must be adapted to fit this population. Information may be received from the O&M specialist in the area.

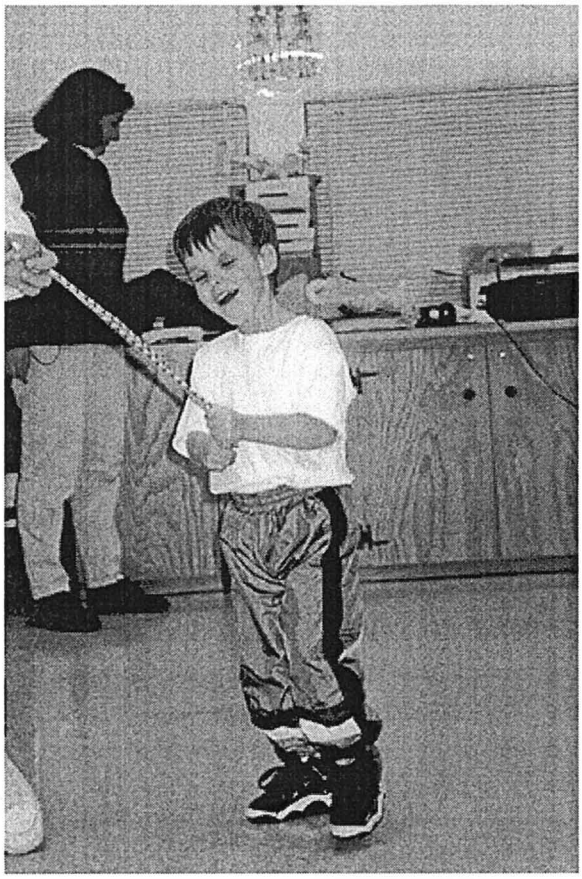


Figure 20 Child enjoys running holding onto rope.

Strengthening exercises must be incorporated to improve posture and general fitness. Screening for delays in skipping, galloping, and running should also be included in physical education classes.

General Fitness

Cardiovascular fitness is sometimes decreased in children with visual impairments.[25] A possible explanation for this is that children with visual impairmenets often lack experience in gross motor tasks that improve aerobic capacity. Other areas that have been commonly found to be decreased are upper extremity strength and hip extensor strength.[26,27] The following activities are designed to improve one or all of these areas.

Throw and Catch

The child catches a large ball, such as a beach ball. Begin in the sitting postion, rolling the ball back and forth so that the child may become accustomed to reciprocal activity. Verbal cues that the ball is coming are necessary. A ball that makes a noise is benefical. Progress to bounce passes and different types of balls.

Riding toys[36]

Bicycles, scooters, pedal cars, and wagons are great toys that provide opportunity for lower extremity strengthening, coordination, and reciprocal movment. Emphasize forward and backward directions to train additional muscle groups. See Figure 21.

Trampoline

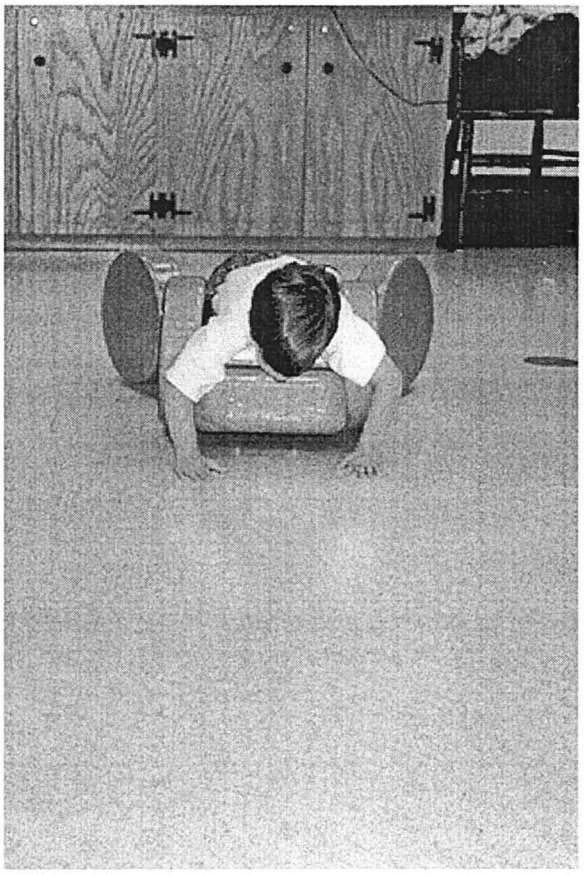
This activity increases vestibular integration, cardiovasuclar endurance, balance, and lower extremity strength. Begin by holding onto child's hands and jumping together. Orient child to size of trampoline.

Stretching Exercise

Teach proper technique for stretching hamstrings, heel cords, shoulders and trunk musculature. Emphasize importance of this prior to regular physical activity. As the child learns to stretch independently, a good time limit per stretch is to sing the ABC's one time through per muscle group.

Treadmill

This is a great activity for hip extensor strengthing and cardiovascular endurance. Child may need to hold onto side rails for safety.



Scooter activity is fun for child.

Other activities that could be included are track and field activities such as running, broad jumping, and the wheelbarrow. These are skills that the child will need in regular physical education classes.

General Considerations

Guidelines to remember when working with children with visual impairments are:[32,34,36]

- Tell the child who you are each time you approach him.
- Describe new objects throroughly.

- Make language as comphrehensible as possible by using short sentences, speaking at a reasonable rate,and stressing important new words.

- Give the child the opportunity to explore movement at his own pace which may be significantly slower than usual.

- Give clear and concise directions, avoid using the words "here" or "there."

- If an activity is too complex for the child, break the activity into its component parts before attempting to perform the task in its entirety.

- Physically assist the child in moving through patterns to facilitate proper sequencing.

- Let the child explore movement throughout his daily activities.

- Have fun during treatment!

APPENDIX A

Child Consent Form

Consent Form

Names of project administrators: Amy Skalsky SPT and Jodi Toenjes SPT

Brandon Hartes has been invited to participate in the production of a video and manual about adapted physical therapy techniques and common physical deficits in children with visual impairments. The purpose of the video and manual is to provide a visual teaching aid for physical therapy students and professionals.

Taping will take place during October, 1997, at the State Developmental Center, Grafton , North Dakota. The taping session will be supervised by a University of North Dakota Physical Therapy faculty member, and the parents are invited to attend. As the child's parent, you will work with the physical therapy students to determine the most convenient time for your child's taping session. Re-taping may need to be rescheduled if complications arise.

No discomforts or risks are anticipated beyond those encountered during a regular physical therapy session. In the unlikely event that this project results in a physical injury, your child will be referred for any necessary treatment including first aid, emergency treatment, and follow-up care as needed. Payment for any such treatments must be provided by you, and your third party payer, if any.

Your child will be recorded on videotape and pictured in a written manual. The video and manual will be used as a visual teaching aid for professionals and students in the physical therapy field. It is possible that your child's diagnosis and/or characteristics may be used to provide rationale for the exercises presented. The name of your child will remain confidential and will be disclosed only with your permission.

Amy Skalsky and Jodi Toenjes may be reached at 787-5493 or 746-1821 respectively to answer any questions that you have concerning this project. If you are uncomfortable directing questions to the project administrators you may contact Peg Mohr of UNDPT at

777-2831. In addition you are encouraged to ask any questions concerning this project that you may have in the future. You many discontinue your child's participation in this project at any time prior to editing without penalty. Your decision to discontinue participation will not affect your present or future relationships with the UND department of Physical Therapy, the State Developmental Center, or the individuals producing the video.

ALL OF MY QUESTIONS HAVE BEEN ANSWERED AND I AM ENCOURAGED TO ASK ANY QUESTIONS I MAY HAVE OF THIS PROJECT IN THE FUTURE. MY SIGNATURE INDICATED THAT I HAVE READ THE ABOVE INFORMATION AND I GIVE PERMISSION FOR Brandon (age) 4 TO PARTICIPATE IN THIS PROJECT.

Signed:

Suzanne Hall — 10-28-97

Parent/Guardian — Date

Amy Skalsky, SPT — 10-28-97

Project Administrator, Amy Skalsky, SPT — Date

Jodi Toenjes, SPT — 10-28-97

Project Administrator, Jodi Toenjes, SPT — Date

Peggy M Mahr — 10-29-97

UNDPT Faculty Member — Date

APPENDIX B

Permission

DEVELOPMENTAL CENTER

DEPARTMENT OF HUMAN SERVICES
GRAFTON, NORTH DAKOTA 58237
(701) 352-4200
(701) 352-4526 TDD (701) 352-4376 FAX

October 27, 1997

To Whom It May Concern:

Jodi Toenjes and Amy Skalsky have permission to use the PT-OT gym and hydro room areas at the Developmental Center to complete their student project. Session will be supervised by PT staff from the Developmental Center.

Kim Olson PT

Kim Olson

APPENDIX C

Infant Consent Form

Consent Form

Names of project administrators: Jodi Toenjes SPT

_____ has been invited to participate in the production of a manual about adapted physical therapy techniques and common physical deficits in children with visual impairments. The purpose of the manual is to provide a visual teaching aid for physical therapy students and professionals.

The physical therapy session will take place on November 20, 1997, at the home of the child. The session will consist of taking photographs of the infant in the prone and supine position while demonstrating physical therapy techniques, such as placing bells on the child's wrists and ankles.

No discomforts or risks are anticipated beyond those encountered during a regular physical therapy session. In the unlikely event that this project results in a physical injury, your child will be referred for any necessary treatment including first aid, emergency treatment, and follow-up care as needed. Payment for any such treatments must be provided by you, and your third party payer, if any.

Your child will be pictured in a written manual. The manual will be used as a visual teaching aid for professionals and students in the physical therapy field. It is possible that your child's diagnosis and/or characteristics may be used to provide rationale for the exercises presented. The name of your child will remain confidential and will be disclosed only with your permission.

Jodi Toenjes may be reached at 746-1821 to answer any questions that you have concerning this project. If you are uncomfortable directing questions to the project administrator, you may contact Peg Mohr of UNDPT at 777-2831. In addition, you are encouraged to ask any questions concerning this project that you may have in the future. You many discontinue your child's participation in this project at any time prior to editing

without penalty. Your decision to discontinue participation will not affect your present or future relationships with the UND department of Physical Therapy, or the individual producing the manual.

ALL OF MY QUESTIONS HAVE BEEN ANSWERED AND I AM ENCOURAGED TO ASK ANY QUESTIONS I MAY HAVE OF THIS PROJECT IN THE FUTURE. MY SIGNATURE INDICATED THAT I HAVE READ THE ABOVE INFORMATION AND I GIVE PERMISSION FOR_____ (age)_____TO PARTICIPATE IN THIS PROJECT.

Signed:

_____ _____

Parent/Guardian Date

_____ _____

Project Administrator, Jodi Toenjes, SPT Date

_____ _____

Witness Date

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